Enumération des Groupes d'Operations d'Ordre Donné. Par RAYMOND LE VAVASSEUR, à Toulouse. Paris, Hermann. 4to, pp. 128, lithographed. No index or title-page. Fr. 5.00.

THE appearance of a new treatise on groups has ceased to be an event in the mathematical world, but M. Le Vavasseur's work is something a little out of the ordinary. For by means of nine chapters devoted respectively to groups of orders p, p^2, pq, 8, $pq^2 (p > q)$, 16, p^2q, $8p$, p^3 and pqr its purpose is to introduce persons unfamiliar with group theory directly to the problems of group construction. And hence everything in each of these chapters is directed towards answering the question, "How many groups are there of the assigned order and what are their equations?"

No knowledge whatever of the subject is assumed. The author begins with the fundamental definitions of the theory and develops the necessary preliminary propositions in a manner that follows Burnside's treatment with considerable exactness, introducing, for instance, into the French terminology such phrases as suite complète, opération conjuguée d'elle même. The whole of the second chapter is adapted from Burnside—so completely that the writer might have expressed an acknowledgment of his source more fully than in the single reference on page 16. These chapters and those immediately following are devoted to the simpler cases of group construction, too familiar ground to admit of much originality in treatment, but the discussion given is lucid and tolerably concise. It is certainly less prolix than Hölder's standard paper in volume 43 of the *Mathematische Annalen*. But this virtue of brevity cannot be claimed for the analysis of groups of order $8p$, as this chapter fills sixty-four pages and embodies a treatise on the group of automorphisms of abelian groups of order p^3 and type (1, 1, 1), with the representation of such groups in linear form and an excursus on bilinear substitutions. While the developments are interesting and while the results are perfectly correct (albeit the conclusions for order 56 are not very clear), yet the results could be attained in a very small fraction of the space used—cf., *e. g.*, Professor Miller's paper in volume 43 of the *Philosophical Magazine*.

All orders less than 30 are discussed with complete thoroughness, and the groups for each case are determined and their equations given. A comparison with Hölder's results seems to show a simpler form of the defining relations, but inasmuch as the simplification is gained by using generators of a higher order its advantage is more or less a matter of taste. The arrangement of the tables is good, but the number of groups for a particular order is not always quite obvious.

The chief defect of the book, however, is its plan. It is evidently intended for beginners, but to set beginners immediately at work on group types is a procedure of very dubious wisdom. The methods involved are necessarily mechanical and monotonous—monotonous in that they demand the solution of a large number of congruences that differ but slightly, and mechanical in that the solution of such congruences adds little to the mathematical knowledge of the student. Moreover, the particular methods employed do not seem well adapted for extension to groups of a higher order—if the chapter on order $8p$ were a fair criterion, more complex groups would necessitate a prohibitive amount of labor. The last chapter however — on orders free from a quadratic factor—adopts Frobenius's method of a congruence with a double modulus, but terminates so abruptly that the author evidently intends to complete it later.

The book is unusually easy to read. Every needed theorem from other branches of mathematics is always fully stated and generally proved. And to those who are studying relations between abstract and linear groups the book may be recommended without hesitation. B. S. Easton.

Elemente der Theorie der Determinanten mit vielen Uebungsaufgaben. Von Dr. P. Mansion. Dritte vermehrte Auflage. Leipzig, Teubner, 1899. 103 pp.

This book, which has passed through six French editions, is an excellent introduction to the more extended treatises of Baltzer, Pascal, and Gordan. Its scope is distinctly elementary. The more complicated developments of determinants, as Laplace's, are passed over with a statement of fact without proof while functional determinants, and the general development with respect to a row and column simultaneously are not mentioned.

The book opens with an introduction of twenty-two pages on determinants of the second and third orders, which are illustrated with a large number of problems. The usual discussion of the elementary properties of the general determinant follows. The points of greatest pedagogical interest are, first, the admir-